



Democratized Energy: The Social Value of Distributed Fuel Cell Systems

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Technology Management, Inc.
Cleveland, Ohio

Website: www.anywhereenergy.com
Facebook: www.facebook.com/Anywhere.Energy





- 24/7 Availability
- Indoor siting
- High fuel efficiency
- Co-generation



Operation on gas *and* liquid fuels:

- Natural gas
- Propane
- Kerosene
- JP-8 (Jet Fuel)
- Diesel
- Ethanol
- Biodiesel
- Vegetable oil (Soy Oil)
- Digester biogas (Simulated)
- Ammonia
- Used cooking oil
- Jatropha

QuadTime™ and a
H2O4 decompressor
are needed to see the picture.



Offsite Demonstrations

2006-2010

Propane
(2006)



Soybean Oil
(2007)

Soybean Oil
(2009)



Soybean Oil
(2008)



JP-8
(2010)

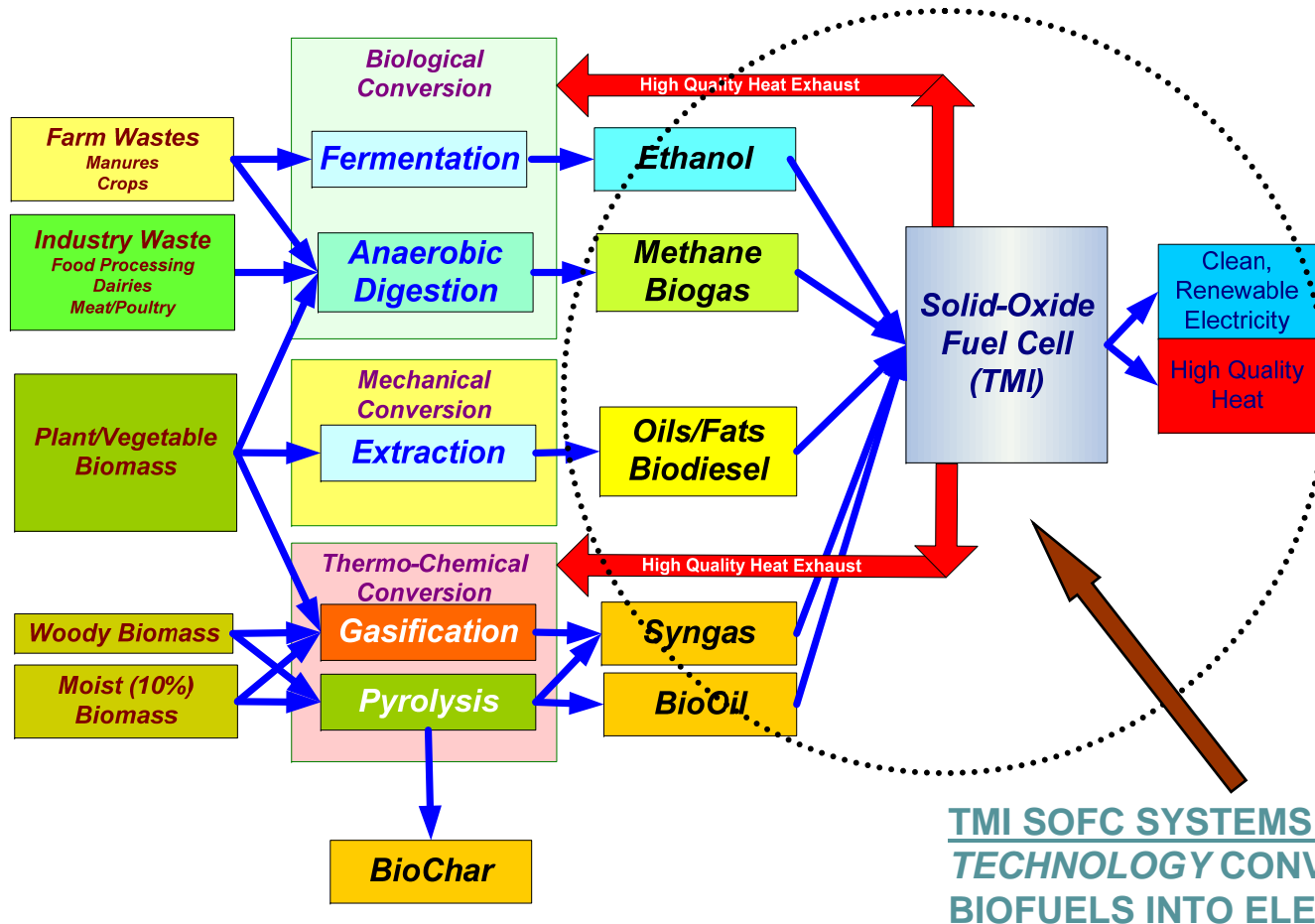
photograph
courtesy of



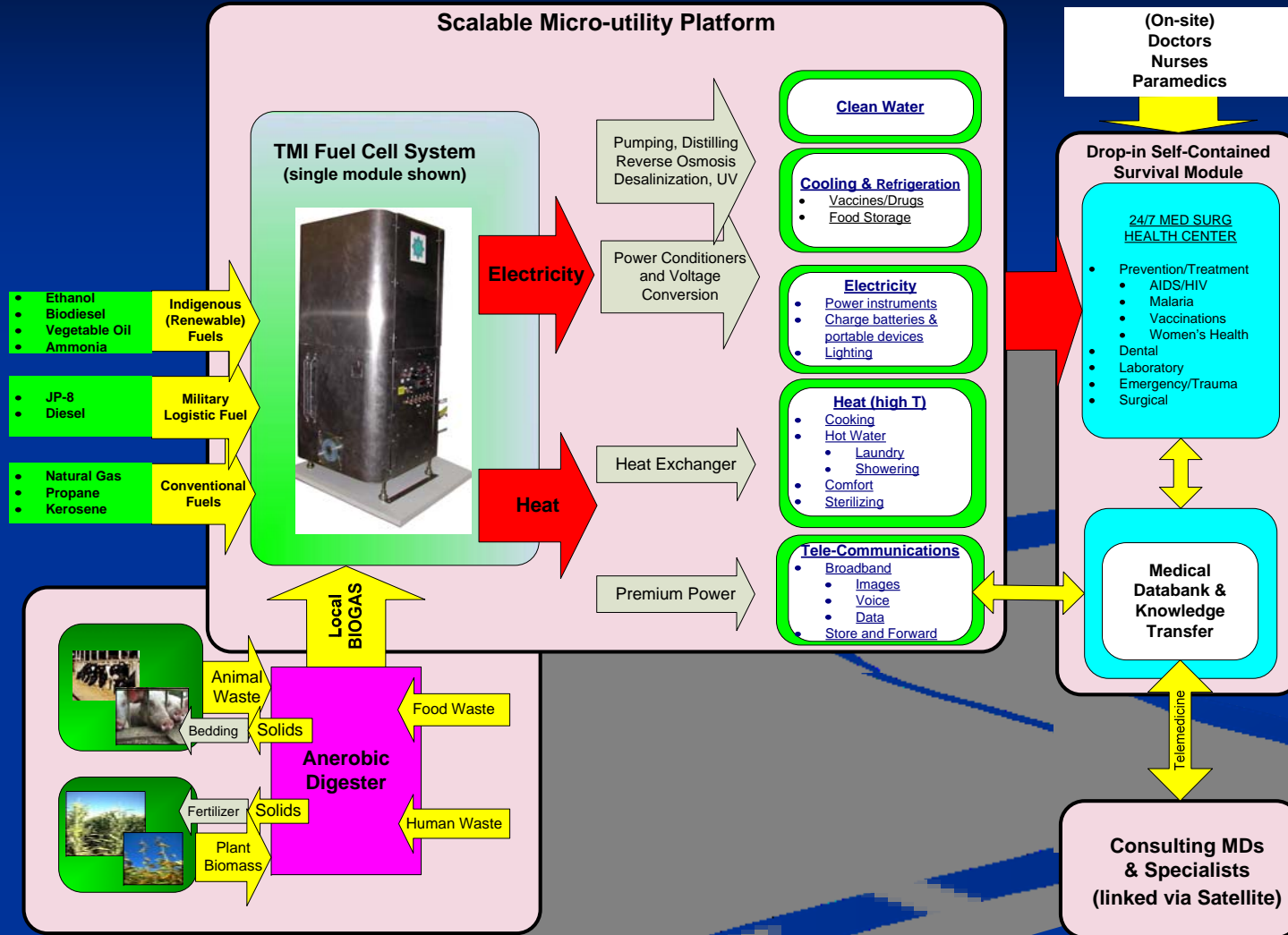
SOFC operates on all Biofuels

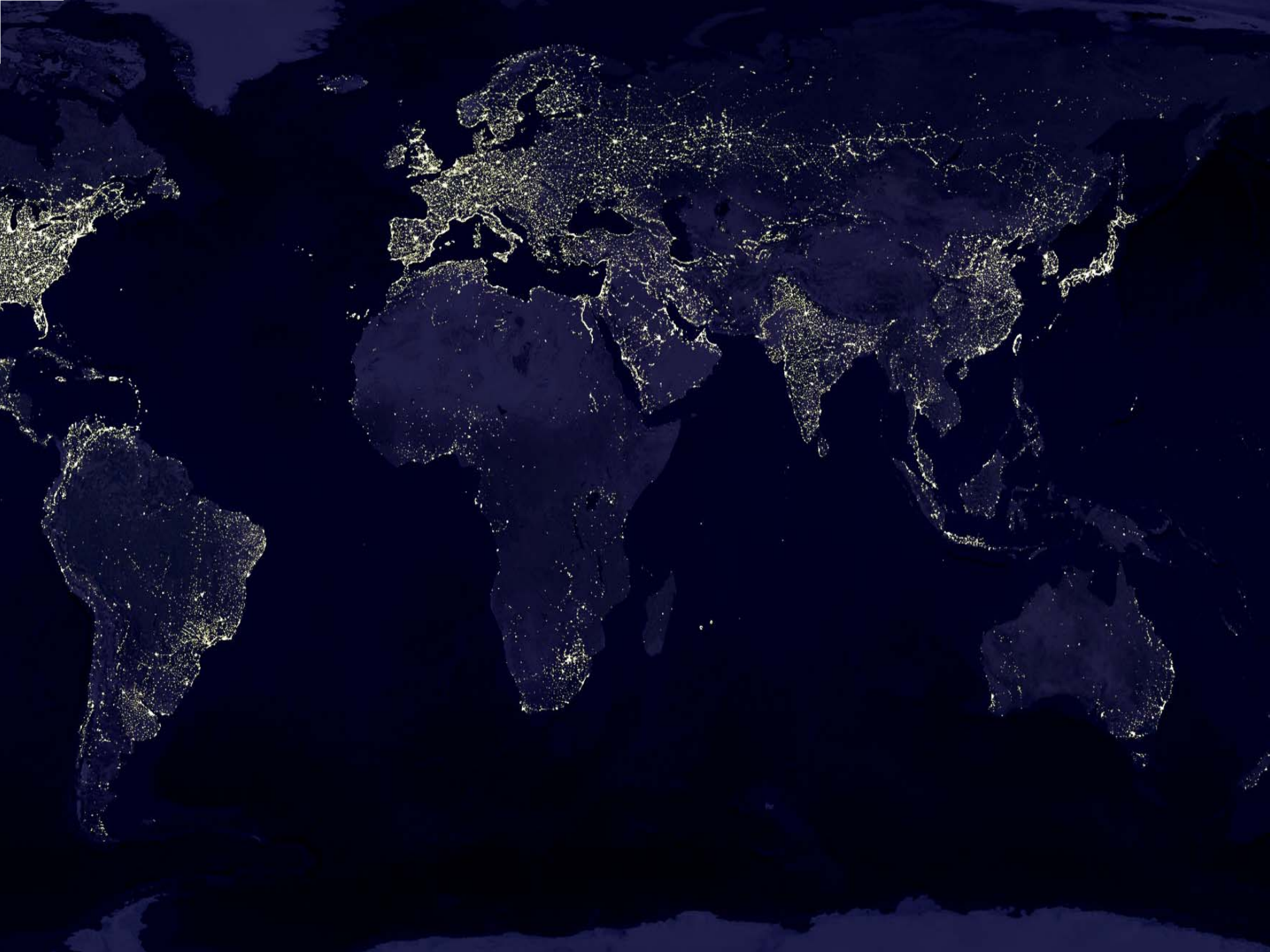
OSU Biomass to Energy* Program

*Dr. Floyd Schanbacher, Founding Director, OSU OARDC



Remote Medical Application of Fuel Cell Systems





World Statistics

- Population: 6.8B
- 3.0B+ live on less than \$2.50 a day.
- 1.6B live without electricity
- Each DAY
 - 24,000 children die due to poverty
 - 6,000 from diarrhea (250/hour !)

Consider

- Poor health and sanitation is a root cause of poverty
- Medicine can only treat.
- Engineers can solve the problems of poor health and sanitation
- Energy infrastructure = Scalable solutions
- 24/7 Energy = Biofuels + Fuel Cells



Energy to Pump Water Through Sand Filters



“We shall not finally defeat AIDS, tuberculosis, malaria, or any of the other infectious diseases that plague the developing world until we have also won the battle for safe drinking water, sanitation and basic health care.”

Kofi Annan, United Nations Secretary-General



One Kilowatt can ...

... can *pump water* from wells or rivers for water filters, sanitation, and irrigation ... for a village of 200 !

... can *power devices* for water purification, refrigeration for vaccines, illuminate microscopes, and power hand-held devices ... and amplify the work of health care prevention and delivery.



Fuel Cell Systems = 24/7 Energy from Indigenous Fuels

such as

... *biogas (methane)* from village digesters using human, animal and food waste (*already in common use throughout the world*)

and

... *bio-oils* pressed from non-edible plant or vegetable oils (e.g., jatropha or used cooking oils) by local farmers.



Systems Thinking, ... across disciplines

Hybrid Business Models

- Impact the end user
 - Individuals, their families, and villages
- Affordable
 - For families making \$300/year
- Scalable
 - Market pull, not technology push
- Profit-driven, not Charity-driven





Women and Children Draw Water and Cook



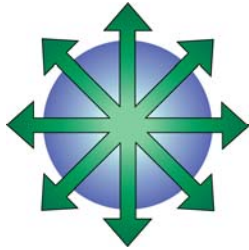
Photo: Royce O. Hall
© Rolex Awards

Partnering with NGOs Working in Villages



**Energy Independence =
Biofuels + Modular Fuel
Cell Energy**

WHY NOT?



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ANYWHERE ENERGY
a TMI company

Thank You

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Photography by Kyle Roth

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21

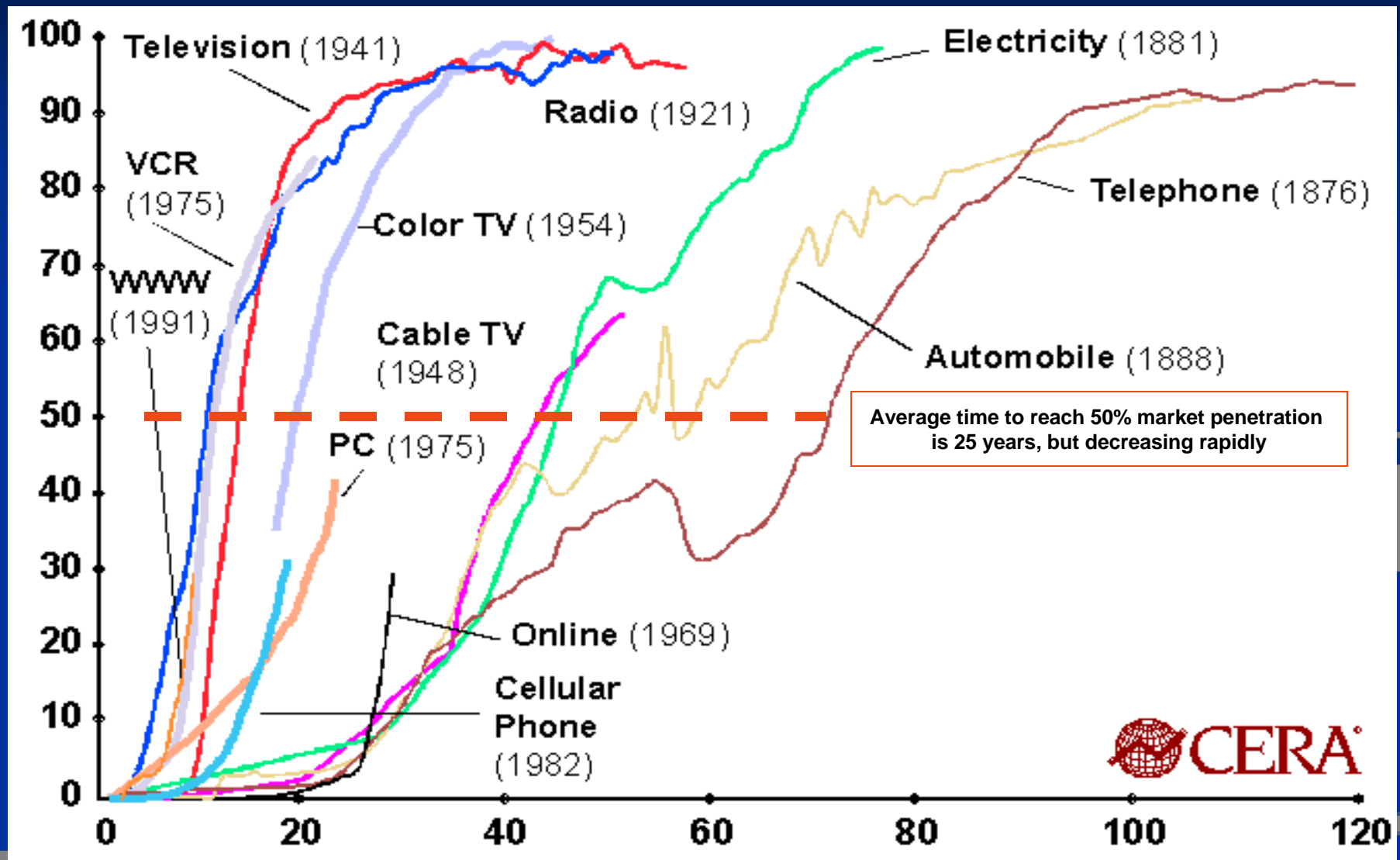


Markets:

- Residential
- Auxiliary Power Units (APUs)
- Military
- Remote
- Commercial
- Rural Farms & Villages

QuickTime™ and a
H.264 decompressor
are needed to see this picture.

Timeline to Commercialize Disruptive Technologies (years)



Examples of Disruptive Technologies

Internal Combustion/Steam Engine

Automobile

Telephone

Airplane

Electricity

Xerography

Digital Printing

On-line Payroll (pre-Internet & pre-PC) (BPLee)

Healing Broken Bones with Electricity (BPLee)

Fuel Cells (BPLee-in progress)



1 kW Public Demonstration on Biofuel

(First known demonstration on soybean oil in the world !)

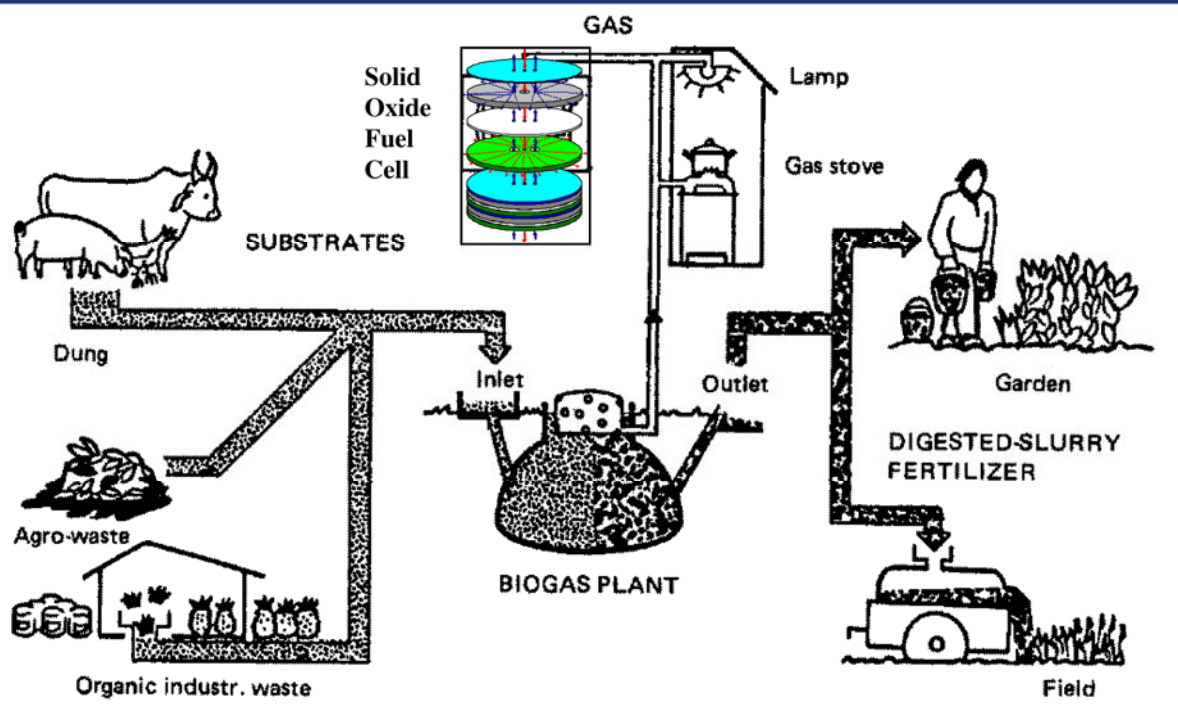
2007 Farm Science Review (London, Ohio)



Dr. Gale Buchanan
USDA Under Secretary

Dr. Bob Moser, Dean
OSU/CFEAS

Mike Petrik, VP
TMI



Energy from Digester Biogas or Pressed from Vegetable Oils